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(54) Title: **FILTER CAKE CLEANUP AND GRAVEL PACK METHODS FOR OIL BASED OR WATER BASED DRILLING FLUIDS**

(57) Abstract: A method is disclosed of gravel packing a wellbore which has at least one aperture therein that provides a fluid flow path between the wellbore and an adjacent subterranean formation. At least a part of the formation adjacent to the open hole has a filter cake coated thereon that comprises a water and oil emulsion. The method of gravel packing comprises injecting into the wellbore a gravel pack composition that comprises gravel and a carrier fluid. The carrier fluid comprises an aqueous liquid having a pH that is outside the range at which the filter cake emulsion is stable. The aqueous liquid is present in an amount effective to invert the water in oil emulsion in the filter cake when the carrier fluid comes into contact with the filter cake. As a result, gravel is deposited at or adjacent to the aperture in the wellbore and some of the filter cake is removed. The remainder of the filter cake and the carrier fluid can be broken simultaneously by contact with a breaker fluid that contains at least one of a surfactant and a mutual solvent.

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INTERNATIONAL SEARCH REPORT

International Application No.

PCT/EP 01/01697

A. CLASSIFICATION OF SUBJECT MATTER
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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 E21B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	US 6 143 698 A (SHARP KEITH W ET AL) 7 November 2000 (2000-11-07) column 3, line 6 - line 12 column 4, line 61 - column 5, line 6 column 8, line 7 - line 43; claims 16-20 ---	1
X,P Y	WO 00 40667 A (SCHLUMBERGER TECHNOLOGY CORP) 13 July 2000 (2000-07-13) page 5, line 25 - page 6, line 12 page 7, line 6 - line 20; claims 16,17,25-29,37,40 ---	1,7,16 1,7,8, 16-19
Y	GB 2 338 254 A (SOFITECH NV) 15 December 1999 (1999-12-15) cited in the application page 2, line 20 - page 3, line 25 -----	1,7,8, 16-19

☐ Further documents are listed in the continuation of box C

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6143698	A	07-11-2000	US 6131661 A	17-10-2000
			AU 1928299 A	28-02-2000
			BR 9815979 A	02-05-2001
			EP 1109875 A1	27-06-2001
			GB 2357538 A	27-06-2001
			NO 20010582 A	02-02-2001
			WO 0008112 A1	17-02-2000
<hr/>				
WO 0040667	A	13-07-2000	US 6140277 A	31-10-2000
			AU 3113400 A	24-07-2000
			NO 20013280 A	29-08-2001
			WO 0040667 A1	13-07-2000
<hr/>				
GB 2338254	A	15-12-1999	US 6263967 B1	24-07-2001